CLAIMS:

1. A porous metal scaffold for use in an implantable medical device comprising:

a porous metal network having pores defined by metal webs, the webs covered with at least one layer of metal particles, the metal particles being bonded to the metal webs.

2. The porous metal scaffold as set forth in claim 1, wherein said metal webs form a continuous inner skeleton of said porous metal scaffold.

3. The porous metal scaffold as set forth in claim 1, wherein the pore size may be varied by bonding additional layers of metal particles to said at least one layer.

4. The porous metal scaffold as set forth in claim 1 wherein the pore size is varied by changing a size of the metal particles.

5. The porous metal scaffold as set forth in claim 1 wherein the bonding is accomplished by sintering the metal particles to said webs.

6. The porous metal scaffold as set forth in claim 1 wherein said webs have partially hollow cores.

7. The porous metal scaffold as set forth in claim 6, wherein the hollow cores of said metal webs are surrounded by an outer web wall that has openings therein.

8. The porous metal scaffold as set forth in claim 1, wherein the pore size ranges from 100 μm to 1000 μm.

9. The porous metal scaffold as set forth in claim 8, wherein the pore volume ranges from 50% to 90%.

10. The porous metal scaffold as set forth in claim 9, wherein the scaffold is formed into a shape having a thickness of 0.5 mm to 5 mm.

11. The porous metal scaffold as set forth in claim 1, wherein the metal scaffold is bonded to a solid metal substrate.

12. The porous metal scaffold as set forth in claim 11, wherein the metal scaffold is directly bonded to the solid metal substrate.

13. The porous metal scaffold as set forth in claim 11, wherein the metal scaffold is sintered to the solid metal substrate.

14. The porous metal scaffold of claim 1, wherein the scaffold includes a plurality of pores having a size greater than about 100 μm.

15. The porous metal scaffold of claim 1, wherein the metal particles have a size from 40 μm to about 80 μm.

16. The porous metal scaffold as set forth in claim 14, wherein the metal of the particles is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

17. The porous metal scaffold as set forth in claim 1, wherein the web metal is selected consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

18. The porous metal scaffold as set forth in claim 11, wherein the metal substrate is part of an orthopedic implant.

19. A method of forming a porous scaffold for use in an implantable medical device, said method comprising:

a) providing a polymer foam having a pre-determined thickness and a pore size ranging from about 500 μm to about 2000 μm;

b) forming a skin of biocompatible metal on said polymer foam by low temperature arc vapor deposition;

c) heating said polymer foam and said metal skin above the decomposition temperature of said polymer foam in an inert gas atmosphere thereby said polymer foam decomposes;

whereby producing a green metal foam.

20. The method of claim 19, further comprising thickening said green metal foam by applying a solution of a binder onto said green foam, applying a metal powder having a pre-determined particle size, and sintering said foam, whereby producing a final metal foam having a pre-determined pore size.

21. The method of claim 19, further comprising repeating said thickening of said foam until said final metal foam has said pre-determined pore size.

22. The method of claim 19, wherein said pre-determined thickness of said polymer foam is between about 0.5 mm and about 10 mm.

23. The method of claim 19, wherein said pre-determined thickness of said polymer foam is between about 1 mm and about 5 mm.

24. The method of claim 19, wherein said pre-determined thickness is between about 1 mm and about 2 mm.

25. The method of claim 19, wherein said polymer foam is a polyurethane foam.

26. The method of claim 19, wherein said polymer foam has a pore size ranging from about 900 μm to about 1100 μm.

27. The method of claim 19, wherein said metal skin has thickness between about 1 μm and about 50 μm.

28. The method of claim 19, wherein said polymer foam has a first side and a second side, and the thickness of said metal skin is about 35 μm on said first side and about 10 μm on said second side.

29. The method of claim 20, wherein said binder solution is an aqueous solution of methyl cellulose.

30. The method of claim 21, wherein said pre-determined particle size is between about 20 μm and about 100 μm.

31. The method of claim 21, wherein said pre-determined particle size is between about 40 μm and about 80 μm.

32. The method of claim 21, wherein said pre-determined pore size of said final metal foam is between about 100 μm and about 1000 μm.

33. The method of claim 21, wherein said pre-determined pore size of said final metal foam is between about 300 μm and about 500 μm.

34. The green metal foam produced by the method of claim 19.

35. The final metal foam produced by the method of claim 20 having said pre-determined pore size of between about 100 μm and about 1000 μm.

36. The final metal foam produced by the method of claim 20 having said pre-determined pore size of between about 300 μm and about 500 μm.

37. The final metal foam produced by the method of claim 21 having said pre-determined pore size of between about 300 μm and about 500 μm.

38. The final metal foam produced by the method of claim 21 made of titanium or titanium alloy.

39. The final metal foam produced by the method of claim 21 having a pore volume from about 50% to about 90%.

40. The final metal foam produced by the method of claim 21 having a pore volume from about 60% to about 80%.

41. The final metal foam produced by the method of claim 21 wherein said final metal foam is attached to a solid metal substrate.

42. The implantable medical device comprising the final metal foam according to claim 41.

43. The implantable medical device of claim 42 being an orthopedic implant.

44. The orthopedic implant of claim 43 that is an acetabular cup implant.

45. The method of claim 19, wherein said metal is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

46. The orthopedic implant of claim 43, wherein said final metal foam is made of a metal selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

47. The orthopedic implant of claim 43, wherein said solid substrate is made of a metal selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

48. The orthopedic implant of claim 43, wherein said final metal foam and said substrate are produced from titanium or titanium alloy.

49. The method of claim 21, wherein said final metal foam is said porous metal scaffold.

50. A method of forming a porous scaffold for use in an implantable medical device, said method comprising:

a) providing a first metal foam of biocompatible metal;

b) spraying an atomized mist of a binder solution on said first metal foam, wherein said mist has an average droplet size ranging from about 20 μm to about 80 μm;

c) delivering a plurality of metal particles to said metal foam;

d) bonding said metal particles to said first metal foam;

whereby producing a second metal foam having smaller pore size than said first metal foam.

51. The method of claim 50, wherein said mist is produced by an ultrasonic source.

52. The method of claim 50, wherein said average droplet size ranges from about 30 μm to about 40 μm.

53. The method of claim 50, wherein said binder solution is an aqueous solution of methyl cellulose.

54. The method of claim 50, wherein said metal of said first metal foam is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

55. The method of claim 50, wherein said metal of said metal particles is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

56. The second metal foam produced by the method of claim 50.

57. The second metal foam produced by the method of claim 50, wherein the pore size of said second metal foam is ranging from about 100 μm to about 1000 μm.

58. The second metal foam produced by the method of claim 50, the pore size of said second metal foam is ranging from about 300 μm to about 500 μm.

59. The method of claim 48, further comprising repeating steps (b), (c), and (d).

60. The method of claim 50, wherein said second metal foam is said porous metal scaffold.

61. A method of forming a porous scaffold for use in an implantable medical device, said method comprising:

a) providing a polymer foam having a pre-determined thickness and a first pore size;

b) forming a metal skin network of biocompatible metal on said polymer foam by low temperature arc vapor deposition;

c) decomposing said polymer foam in an inert gas atmosphere thereby forming a green metal foam;

d) pre-sintering said green metal foam;

e) contacting said pre-sintered metal foam with metal particles in the presence of a binder;

f) bonding said metallic particles to said pre-sintered metal foam;

whereby obtaining said porous scaffold having pores of a second pore size.

62. The method of claim 61, wherein said pre-determined thickness of said polymer foam is from about 0.5 mm to about 2 mm.

63. The method of claim 61, wherein said first pore size is from about 900 μm to about 1100 μm.

64. The method of claim 61, wherein said inert atmosphere is argon atmosphere.

65. The method of claim 61, wherein said second pore size is from about 300 μm to about 500 μm.

66. The method of claim 61, wherein said metal particles and said pre-sintered foam are bonded by sintering.

67. The porous scaffold produced by the method of claim 61.

68. The method of claim 61, wherein the metal of said porous metal scaffold is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

69. The method of claim 61, wherein the metal of said metal particles is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

70. A method of improving stability of a porous scaffold in an orthopedic implant, said method comprising

a) providing a pre-cursor for the orthopedic implant, said pre-cursor comprising a body and a spaced member attached to said body,

said spaced member comprising a wall member spaced from said body and a spacer element connecting said wall member to said body thereby said spacer element, said body, and said wall member define a recess;

b) attaching said porous scaffold to said body, wherein said porous scaffold has a pre-determined pore size and includes a first portion and a second portion, said second portion of said scaffold extending into said recess;

c) filling said recess, including said second portion of said porous scaffold, with metal particles having a particle size smaller than said pore size of said porous scaffold thereby the pores of said second portion of said porous scaffold are filled with said metal particles;

d) sintering said implant pre-cursor, said metal particles, and said attached porous scaffold including said filled second portion thereby converting said spaced member, including said filled recess to a substantially solid metal block, including converting said filled second portion of said scaffold to a substantially solid portion of said substantially solid metal block;

whereby said substantially solid portion at least partially supports said first portion of said porous scaffold.

71. The method of claim 70, further comprising subjecting said pre-cursor having the filled spaced member to a vibrational treatment before sintering.

72. The orthopedic implant produced by the method of claim 70.

73. A method of improving stability of a porous scaffold in an acetabular cup implant, said method comprising

a) providing a blank acetabular cup shell comprising a body having a top surface and including a rim, said rim comprising a ledge and a wall spaced from said body of said blank acetabular cup shell thereby said ledge, said body, and said wall define an annular recess;

b) attaching said porous scaffold to said top surface of body, wherein said porous scaffold has a pre-determined pore size and includes a first portion and a second portion, said second portion of said scaffold extending into said annular recess;

c) filling said recess, including said second portion of said porous scaffold, with metal particles having a particle size smaller than said pore size of said porous scaffold thereby the pore of said second portion of said porous scaffold are filled with said metal particles;

d) bonding said particles to said ledge, said wall, said second portion of said porous scaffold, and to each other thereby converting said rim to a substantially solid metal block, including converting said filled second portion of said scaffold to a substantially solid portion of said substantially solid block;

whereby said substantially solid portion at least partially supports said first portion of said porous scaffold.

74. The method of claim 73, wherein said bonding comprises sintering.

75. The method of claim 73, further comprising machining said substantially solid block into a desired shape.

76. The method of claim 73, wherein the metal of said metal particles is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

77. The method of claim 73, wherein the metal of said porous scaffold is selected from the group consisting of titanium, titanium alloy, cobalt chrome alloy, niobium and tantalum.

78. The acetabular cup implant that includes an acetabular cup shell produced according to the method of claim 73.

79. The porous metal scaffold of claim 1, further comprising a biocompatible coating.

80. The final metal foam of claim 35, further comprising a biocompatible coating.

81. The acetabular cup implant of claim 78, wherein said porous scaffold further comprises a biocompatible coating.